

Thermophysical Properties of Aqueous Alkanolamines

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The enthalpies of solution of sour gases (carbon dioxide and hydrogen sulfide) in aqueous alkanolamines are useful in the model development required for the design of equipment used for the separation of acid gas impurities from sour gas streams. They can be derived from either solubility or direct calorimetric measurements. One cannot derive values of the enthalpy of solution at low carbon dioxide loading from solubility measurements. There have been few direct measurements of the enthalpy of solution and the available measurements show considerable scatter with respect to both temperature and mass percent of alkanolamine. Direct determination of the enthalpy of solution of carbon dioxide at effectively infinite dilution in various concentrations of selected alkanolamines and alkanolamine mixtures at various temperatures have been measured using a modified isothermal dilution calorimeter. The energy removed by a Peltier cooling unit running at high power is balanced by the addition of electrical energy to maintain the calorimeter isothermal to within 0.001 K. When carbon dioxide is added the electrical energy is turned off for known periods of time to maintain the calorimeter isothermal. The number of moles of carbon dioxide injected into the calorimeter is determined from the change in pressure in a known volume of the gas maintained at the thermostat temperature. A description of the present experimental arrangement will be given along with some typical results. Results appear to be accurate to 1%. Comparisons will be made with the available literature data. In addition density and viscosity measurements have been made on the mixtures with and without carbon dioxide. The experimental techniques used and some typical results will be described and compared with previous measurements.